



# ESGF: Compute Working Team Python End User API

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Charles Doutriaux, Jason Boutte,  
ESGF Compute Working Team

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# Why?

- Server API is done and language agnostic
- What does this mean for the end-user?

— Long URLs: [http://aims2.llnl.gov/wps?](http://aims2.llnl.gov/wps?service=WPS&version=1.0.0&request=Execute&datainputs=[domain=[];variable=[{)

```
service=WPS&version=1.0.0&request=Execute&datainputs=[domain=[];variable=[{"id":"tas|v0","uri":"http://esg.cnrn-game-meteo.fr/thredds/dodsC/CMIP5_CNRM/output1/CNRM-CERFACS/CNRM-CM5/historical/mon/atmos/Amon/r1i1p1/v20110901/tas/tas_Amon_CNRM-CM5_historical_r1i1p1_185001-189912.nc"}, {"id":"tas|v1","uri":"http://esg.cnrn-game-meteo.fr/thredds/dodsC/CMIP5_CNRM/output1/CNRM-CERFACS/CNRM-CM5/historical/mon/atmos/Amon/r2i1p1/v20110901/tas/tas_Amon_CNRM-CM5_historical_r2i1p1_185001-189912.nc"}, {"id":"tas|v2","uri":"https://esgf.nccs.nasa.gov/thredds/dodsC/CMIP5/NASA/GISS/historical/E2-H_historical_r1i1p1/tas_Amon_GISS-E2-H_historical_r1i1p1_185001-190012.nc"}, {"id":"tas|v3","uri":"https://esgf.nccs.nasa.gov/thredds/dodsC/CMIP5/NASA/GISS/historical/E2-H_historical_r2i1p1/tas_Amon_GISS-E2-H_historical_r2i1p1_185001-190012.nc"}];operation=[{"input":["v0","v1"],"name":"ensemble.cdat","result":"cnrm"}, {"input":["v2","v3"],"name":"ensemble.cdat","result":"giss"}, {"input":["cnrm","giss"],"name":"multi.mv"}];
```

# Solutions?

- Do nothing: esgf users are smart! They'll figure it out
- Develop a UI:
  - Time consuming
  - Not necessarily falling into the skills set of a “compute” team
  - User will reject it (uggly, not enough functionalities, etc...)
- Develop an API to unlock the potential for all.

# We went for the API

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- We picked Python
  - Widely adopted
  - Lots of tools for web things already
  - ESGF eco-system is filled with it
- Mainly we had to implement our Web API specific keywords

# Implemented

- WPS: Provides details of a WPS server (Identification & Provider), access to all processes supported by a server.
- Dimension: Provides information about a spatial or temporal dimension; the start, stop and stepping.
- Domain: Provides information for sub-setting input data along spatial and temporal axes.
- Variable: Provides information about an input file; URI, variable name, mask, domain
- Gridder: Provides details used to re-grid a Variable
- Mask: Provides a way to define the areas of interest by applying comparisons between Variable data and/or pre-defined functions (sin, cos, etc)
- (NamedParameter: Provides the ability to pass additional parameters to a process (API can auto generate these))
- Operation: Provides access to a WPS process, allows execution on a remote server and access to the processes output

# Example

```
# First we need to import a few things
from esgf import WPS
from esgf import Variable
# Now let's connect to our server
wps = WPS('http://0.0.0.0:8000/wps/',username="wps_test",password="Abc123!!")
# let's use a variable in the file we are serving locally via the server
T = Variable('/ServedData/famipc5_ne30_v0.3_00003.cam.h0.1979-01_regrid.nc', 'T')
# Now let's select the process we want to use
process = wps.get_process('cdat.averager')
# Let's ask the server to average T over lat/lon
process.execute(inputs=[T], axes='longitude|latitude')
# Ok we could use this further in wps or we can use it locally
# let's load the file locally
import cdms2
f=cdms2.open(process.output.uri)
T_avg = f[process.output.var_name]
print T_avg.shape
```

# Future

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- Keep Compatibility with ESGF Compute API changes
- Support workflow creation
- Add server discovery tools
  - Federated server selection
  - Server capability querying
  - Server load monitoring
  - Server holdings

# Further Reading/Getting Involved

- Code: <http://github.com/ESGF/esgf-compute-api>
- Documentation: <http://esgf-compute-api.readthedocs.io/en/latest/>
- Anaconda: <https://anaconda.org/uvcdat/esgf-compute-api>
- Demo tomorrow: <http://github.com/doutriaux1/jupyter-notebook/cwt>
- Email: [esgf-cwt@llnl.gov](mailto:esgf-cwt@llnl.gov)